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Bachelor Thesis

Efficiency Effects:
The Effects of a Horizontal Merger on Cost-Efficiency

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Executive Summary

In this thesis, the effects of a merger on the cost-efficiency of the merging firms are investigated by conducting both a literature review and an empirical analysis. In the literature review the efficiency effects (which can be either positive or negative) that could result from mergers are highlighted. The empirical analysis discusses one specific type of efficiency effect, namely the effects of scale on performance measures in the industry of the Dutch housing corporations.

A merger can give rise to increased efficiency in the following ways. First, when marginal costs of the merging firms are different before the merger, re-allocating output from one firm to the other can reduce total costs. Second, economies of scale and scope might make the firm more efficient. Third, a merger could stimulate technological progress that leads to lower costs of production by fostering diffusion of know-how and encouraging innovation. Fourth, the merged firm might benefit from purchasing economies that result from having a stronger bargaining position for inputs and costs of capital after the merger. Finally, workers might be more motivated to work in a larger, merged firm compared to the pre-merger firm. This gives rise to higher productivity and hence, lower costs of personnel per unit of output.

After a merger, the firm might be less efficient than the individual firms were before the merger. These cost inefficiencies come from the following sources. First, the merger itself is a very costly and risky transaction, giving rise to many costs before, during, and after the merger. Second, diseconomies of scale may arise. Also, a merger could give rise to lower incentives to invest in R&D, leaving opportunities to lower future costs unexploited. Moreover, before, during, and after the merger, the managers have to make many important decisions that could be regretted in hindsight. Finally, mergers might affect workers' behaviour by decreasing incentives to exert effort or by increasing incentives to pursue personal objectives rather than those of the firm.

Furthermore, in this thesis, an empirical analysis has been conducted on scale effects in the hotly debated industry of the Dutch housing corporations. The conclusions from this research are based on a combination of the data acquired by Deloitte Real Estate Advisory and Kwaliteitscentrum Woningcorporaties Huursector (KWH). This dataset is valuable, because almost every Dutch housing corporation is listed, the observations are very recent, and it has

not been used before for this purpose by other researchers. By making use of linear multiple regressions one specific type of efficiency effect resulting from a merger between Dutch housing corporations is investigated, namely the effects of scale on performance measures. In these regressions other characteristics of the housing corporations are controlled for, such as the share of accessible dwellings, the share of dwellings that is designated for the handicapped and aged people, and the average value of the dwellings that are owned by the corporation. Based on the empirical evidence, it can be concluded that the average variable expenses and average net total expenses slightly increase when a housing corporation owns more dwellings. It was also found that when a corporation grows larger in terms of number of dwellings owned, the productivity of its workers and the assessed quality of the service it provides generally decreases. Average net total expenses of the corporations did not seem to significantly explain any part of the assessed quality and therefore the efficiency-quality trade-off is not likely to exist in the housing market. The models also revealed that corporations with a higher average value of their dwellings have higher average variable expenses and higher average net total expenses. Finally, corporations with a larger share of accessible dwellings tend to have higher average variable expenses.

Important limitations that might affect the results of this thesis are the problems associated with confounding variables, reversed causation and the inclusion of both costs and income from other activities than renting out dwellings in the performance measures of the housing corporations. It is important to keep these limitations in mind when evaluating the conclusions, because they affect the results on which the conclusions are based. For further research, a time-series analysis with more characteristics of the housing corporations is recommended that allows other efficiency gains than scale effects to be taken into account and allows to reduce the problem of reversed causation.

Only the findings regarding the average variable expenses cannot be generalized beyond the sample due to violations of the tested underlying assumptions of the Ordinary Least Squares regressions. The other findings contribute to a general understanding of the performance of Dutch housing corporations and this might be useful for the evaluation of mergers.

Chapter 1: Introduction

1.1 Introduction

Since the first merger wave of the 1980s, mergers have become an increasingly popular business strategy and five merger waves have occurred since then (Lipton, 2006). Figure 1 displays the value and total number of worldwide announced mergers and acquisitions[1] that occurred during the period 1985-2011. In this thesis, the motives of this popular business strategy will be analysed. More specifically, the main focus lies on cost (in)efficiencies[2] that are derived from mergers.

Dutch housing corporations witnessed a lot of mergers and as a result their number has halved during the period 1998-2009 (CFV, 2010). The housing corporations are positioned between the free market and the state so they have a unique role in the Dutch society. They have this position, because the corporations are private firms that fulfil the social objective of providing housing to the groups of people that are not able to find their own housing. Their non-profit mentality narrows down the motives to merge, because there is no motive to increase the profitability of the corporation. At the same time, the non-profit housing corporations highly value cost savings as an incentive to merge. Therefore, the housing corporation industry is very suitable for analysing efficiency effects resulting from a merger.

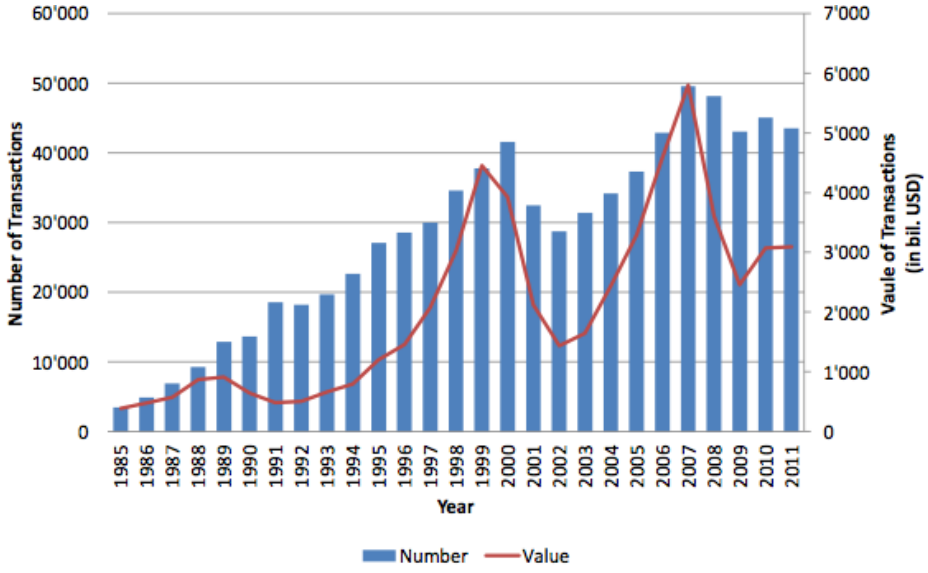


Figure 1[3]

[1] In this study, both mergers and acquisitions will be referred to as mergers.
[2] Cost (in)efficiencies arise when the total costs per unit of output of the firm changes as a result of the merger.
[3] Source: http://www.imaa-institute.org/statistics-mergers-acquisitions.html (01-06-2012).

1.2 Research Question

Merger motives and the effects of a merger on the cost-efficiency of the firm has been the focus of many studies, both theoretical (Delens, 2005; D'Anvers, 2005; and Röller, Stennek & Verboven, 2000) and empirical (Peristiani, 1996 and DeYoung, 1993). However, theoretical work is often very narrow in the sense that it focuses only on a particular industry or it shows only one side of the efficiency effects (either only the efficiency gains or only the efficiency losses). Moreover, these theoretical studies often do not clearly structure all the effects in order to make the distinction between different sources of (in)efficiencies. The sources of the efficiency effects are important to the merging parties themselves, but also for the antitrust authorities that have to evaluate the merger. There are not many empirical studies available that focus on the efficiency effects of Dutch housing corporations after a merger. Most often, efficiencies in the banking and health sector are discussed in empirical papers. In order to reveal a unique theoretical aspect, the following research question will be answered in this thesis:

Is there a relationship between the occurrence of a horizontal merger and the cost-efficiency of the participating firms, and, if so, how can this relationship be explained?

A merger might result in a more cost-efficient firm (which is welfare improving) or a less cost-efficient one (which is welfare deteriorating), depending on the characteristics of the firms and the industry. Efficiency effects can alter both fixed and variable costs of the firm, resulting in a change in optimal pricing policy when the efficiency effect affects variable costs. Efficiency effects might be achieved in the long-run and in the short-run, which makes them very difficult to estimate (Ivaldi et al., 2003). Also, for antitrust authorities it is difficult to assess the value of the efficiency effects ex-ante, because they generally do not have access to all the information the merging firms have. Since in general only merger-specific efficiency gains are likely to outweigh the welfare deteriorating results of the other merger effects, they are often the only type of efficiency gains that are considered favourably by antitrust authorities. Efficiency gains are merger-specific when they could not be achieved without the merger (Motta, 2004).

Efficiency effects are not the only type of effects that affect the profitability of the merging firms after the merger. Other merger effects that arise after a merger are the unilateral effect and the pro-collusive effects (Motta, 2004).

The unilateral effect arises when the merging firms benefit from increased market power[4] after the merger that does not result from coordination with rivals (Slade, 2004). Firms are more willing to increase prices after the merger, because then they take the externalities imposed on the partner-firms into account; when one firm increases its prices in the relevant market, the partner-firms benefit from an increase in residual demand and profits, making the price increase more attractive. Antitrust authorities will prohibit a merger that gives rise to a unilateral effect when no other welfare improving effects are expected to prevail, because the unilateral effect itself causes prices to rise and welfare to deteriorate.

Pro-collusive effects make collusion among the firms in the market more sustainable. When firms collude, they jointly coordinate on their prices or quantities in order to maximize joint profits (Motta, 2004). The likelihood that collusion will be sustainable is market-dependent, but a merger could increase profitability of collusion in the following two ways (Sabbatini, 2006). First, with fewer competitors after the merger, firms are more willing to coordinate, because of the lower bargaining costs[5]. Besides, with fewer competitors in the market, there is less to gain from deviating on the agreement (for example, fewer customers could be captured from rivals by asking a lower price). Second, the firms in the market might become more symmetric in terms of size, which increases chances of successful negotiations, as firms that are alike are more likely to come to an agreement than firms that are very different. Since collusion results in higher prices and lower welfare, antitrust authorities will prohibit mergers with pro-collusive effects when no other welfare improving effects are expected to prevail.

The main focus of this thesis will be on efficiency effects that result from a merger, because these are the only type of effects that benefits both the producers and the customers and is therefore always desirable from a social point of view. When the sources of efficiency effects can be identified, antitrust authorities are more able to distinguish between welfare improving and welfare deteriorating mergers.

[4] Market power: The ability to raise prices above marginal costs.
[5] Bargaining costs: Time and financial resources invested in order to come to an agreement.

In order to facilitate answering the research question posed above, the following sub-questions have been added.

1) *How could a horizontal merger lead to increased cost-efficiency of the firms?*
2) *How could a horizontal merger lead to decreased cost-efficiency of the firms?*
3) *Do (dis)economies of scale prevail in the industry of the Dutch housing corporations?*

By answering these sub-questions, this thesis contributes to existing literature in the following two ways. First, a coherent and structured framework will be provided in which both the sources of efficiency gains and losses resulting from a merger will be discussed. Second, empirical research will be conducted on the sector of the housing corporations (which is scarce) that might contribute to organisational policy and governmental policy. The data used for this empirical research is valuable, because almost every Dutch housing corporation is listed, it contains very recent information, and it has not been used before by other empiricists. That said, however, it is important to emphasize that due to a lack of data over time, this empirical research only focuses on one specific type of efficiency effect resulting from a merger between Dutch housing corporations, namely the scale effects. As will be discussed in greater detail later on, these scale effects are likely to be the most important efficiency effect that results from a merger in the Dutch housing industry. Therefore, testing the effect of scale on the costs of the corporations adds value to the already existing literature.

It is of social and scientific relevance to know whether and how efficiency effects resulting from a merger occur, because these (in)efficiencies affect prices charged to the customers and profits earned by the firms. When prices and profits change, welfare is affected (which is one of the most important concepts in economics).

1.3 Thesis Structure

The remainder of this thesis will be organized in the following manner. In chapters 2 and 3, efficiency gains and losses resulting from a merger will be discussed. Almost all efficiency effects that are discussed in these chapters can also result from a merger between housing corporations. In chapter 4, the effects of scale on performance measures of Dutch housing corporations will be empirically tested. Note that only correlations between scale and performance measures can be identified. Causality cannot be assessed, because it is also possible that performance measures affect scale, for instance because low values of these measures can be a reason for merging. Finally, in chapter 5, the thesis will be concluded.

Chapter 2: Efficiency Gains Resulting From a Merger

In this section, the possible efficiency gains resulting from a merger will be discussed. There are different ways how efficiency gains can be categorized. The typology is based on the concept of the production function that relates inputs to output (Röller, Stennek & Verboven, 2000). This typology distinguishes between the different sources of the efficiency gains. Each of the following five sources will be discussed separately:

- Rationalisation of output
- Economies of scale and scope
- Technological progress
- Purchasing economies
- Slack reduction

As discussed before, the source of the costs savings is very important to the antitrust authorities, because only merger-specific efficiency gains are generally accepted in a merger defence.

2.1 Rationalisation of Output

Total costs of the merged firms might be reduced when production is re-allocated from one plant to another. Assuming that both plants continue to exist after the merger and both plants are able to produce the same product, the firm might decide to shift outputs of the plants in order to create equal marginal costs. One extreme case is when the marginal costs of one plant are lower at all levels of output than the marginal costs of the other plant. When this happens, it will be optimal to shut down the inefficient plant and to shift all its output to the other one. It is inefficient when one plant produces at higher marginal costs than the other, because shifting production from the plant with the higher marginal costs to the plant with the lower marginal costs will reduce the total amount of financial resources spent on producing the output. This is referred to as output rationalization.

There are three possible explanations as to why marginal costs of the plants differ before a merger (Röller, Stennek & Verboven, 2000). The first and probably most important explanation of output rationalisation results from the fact that often marginal costs increase as output increases. Due to the law of diminishing returns[6] and plant capacity being fixed in the

[6] Law of diminishing return states that when variable inputs are doubled, output will be less than doubled.

short-run, the marginal costs of two plants will be different when they produce different quantities of output. Second, when the amounts of capital owned by the plants differ, the cost functions also differ, because plants with more capital are generally more efficient. Finally, workers in a plant might have superior knowledge or another form of competitive advantage (for example, a patent) that allows them to produce at lower costs.

Until now, rationalisation has only been discussed in the context of mergers between manufacturers. However, rationalisation of output could occur in every output-producing sector in order to reduce costs. For instance, customers of one housing corporation can be served by the other corporation after the merger when their head quarter is located closer by. By rationalizing output (service), total transportation costs are reduced and so the corporation is more efficient.

2.2 Economies of Scale and Scope

If there is a reduction in total costs per unit of output when total output increases, a firm exhibits economies of scale. When two firms merge, they combine their output and hence exploit the economies of scale. Economies of scope occur when extra benefits arise from the merger by cooperating and coordinating the assets of the firms.

2.2.1 Economies of Scale

Based on their sources, economies of scale can be classified into five groups: bulk discounts, higher efficiency in high capital equipment, spreading of fixed costs, specialisation and earnings diversification. Below, each source will be discussed separately.

Suppliers of inputs often apply a non-linear pricing system. Contrary to the linear pricing system, price per unit of input under a non-linear pricing system decreases when customers buy a larger amount of the input (Feldstein, 1972). As a result of the merger, the new firm will be larger in terms of output than the firms before the merger and hence there will be more demand for the input by the larger merged firm (ceteris paribus). When a non-linear pricing scheme is applied, input costs of the merged firm will be lower than the combined input costs of the participating firms before the merger.

Scale economies might also be a result of higher efficiency with high capital equipment. For firms with a small output, it is not worthwhile to invest in expensive technologies in order to

reduce marginal costs, because they increase capital costs per unit of output by a too large amount (the costs are too high compared to the benefits). Since the merged firm faces a larger output, it might be profitable to invest in technologies that reduce marginal costs, because the investment costs are spread over a larger output. These capital investments are costly and increase capital cost per unit of output, but as long as this increase is smaller than the decrease in operating costs per unit of output, the investments are profitable (Silberston, 1972).

Often, a firm has some overcapacity in one or more departments of the company that cannot be scaled down (Delens, 2005). This overcapacity does not directly have to relate to the output produced by the firm. One example is the customer service department of housing corporations; every corporation has such a department and they are large enough to keep on operating efficiently when the amount of customers increases. The costs of these departments are fixed so when output increases, the fixed costs per unit of output will decrease. When two firms merge, perhaps only one department can perform all operations and the other department can be shut down. The merger avoids double production of fixed costs and hence becomes more cost-efficient. Similarly, a merger could avoid double production of all types of fixed costs (such as R&D expenses and management costs) in all types of organisations.

Large firms have a bigger incentive to specialize their personnel than firms with a small output. When a firm specializes its employees, there are three effects that make the workers more efficient (West, 1964). First, workers increase skills and knowledge by focusing on fewer processes. Second, there will be time savings, because workers do not have to switch processes anymore. Third, innovation is encouraged, because workers focus on only one specific part of the production process. On the other hand, specialization is costly because the firm requires extra financial resources to train its personnel and to keep their specialized knowledge up-to-date. When a small firm specializes, every specialized employee produces only a small amount of output. Since each employee produces only a small amount, overcapacity arises; they can produce a larger output without increasing costs. The high costs of specialization might then outweigh the benefits and hence it is not profit maximizing to train employees with the purpose of specialization. When two firms merge, output increases and hence overcapacity resulting from specialization will be reduced. This might result in a situation where specialization is profitable.

Finally, a source of scale economies is earnings diversification (Cummins and Xie, 2008). When companies have a large output, their expected costs of the year are more predictable according to the law of large numbers[7]. For instance, when a housing corporation rents out more dwellings, its future maintenance costs become more predictable. With more predictable and hence less volatile costs, the company needs a provision for less equity capital per customer, which provides the opportunity to lower costs.

2.2.2 Economies of Scope

Somewhat related to economies of scale are economies of scope. Economies of scope arise when it is less costly to produce two product lines in one company than when each company separately produces a product (Goldstein and Gronberg, 1984). Since a merger leads to pooling of both firms' assets, all assets can be put to use in their most productive way by one single firm. Note that this is related to the cost reductions resulting from rationalisation of output. However, economies of scope result from coordination of inputs and other activities rather than re-allocating output from one company to the other.

It is conceivable, that two rival firms both have their own marketing and distribution departments, but where it would be more profitable to jointly coordinate these activities (Delens, 2005). Besides the scale economies that could arise, coordination of these activities would result in additional benefits. Also, by having a larger network, a merger can reduce distribution costs, because it increases the scope for logistical improvements.

Firms often have some undesired overcapacity that for some reason cannot be reduced, but would be possible to cut when the firms merge (EC case 4439, 2007). For instance, when one housing corporation has excess cash while another corporation is in need of cash to finance its activities or investments, the merger would result in an internal capital market, lower interest expenses and more efficiency (Delens, 2005)[8].

2.3 Technological Progress

Often, different firms have different knowledge, technologies, organisations, experience and assets that cannot be easily replicated. When the two firms merge, the combination of these

[7] Law of large numbers describes that the more an experiment is repeated, the closer average values will lie to the expected values and so average values can be estimated more accurately.
[8] Two employees of KWH (independently) told me that this is expected to be one of the most important reasons of the housing corporations to merge.

competitive advantages might result in technological advancement and a superior production function that could not be achieved otherwise. These efficiency gains are a type of synergy; "synergies require cooperation and coordination of the two firms' assets that allow a superior production function, as distinct from causing different choices on a fixed production function" (Farrell & Shapiro, 2000). Note that under this definition, economies of scope can also be defined as synergies.

The concept of technological progress is related to scope economies, but scope economies result from the pooling of the assets of both firms whereas technological progress results from a different process used to create output with these assets. A merger could give rise to technological progress by encouraging diffusion of know-how and encouraging innovation. In this section, both effects will be discussed separately.

2.3.1 Diffusion of Know-How

First, diffusion of know-how may occur when one firm has a better management than the other firm. By substituting the managers that performed poorly of one firm with better performing managers of the other firm, both firms benefit from the skills of one manager[9] (Motta, 2004 and Matsusaka, 1993). In the literature, this argument is also referred to as the "managerial discipline theory". Besides, the skills and knowledge of the managers of different organisations might be complementary and so the combination of managers would lead to superior performance.

Second, firms may have other complementary assets that allow for a superior production function when they are integrated and coordinated. One example of these assets is patents or other intellectual property rights (Crane, 2011); when one firm has the property rights of using a technology that can only be efficiently used in combination with another technology that is owned by another firm, the merger leads to a more efficient implementation of these technologies and hence lower costs.

Finally, when the merger occurs in an industry where firms go down the learning curve as they produce more, the learning process could be shortened for at least one firm (D'Anvers, 2005). Learning refers to the advantages that can be captured by accumulating experience and

[9] With empirical evidence, Walsh (1988) proved that the turnover rate of the acquired firm's top management after an acquisition was significantly higher than "normal" turnover rates.

know-how (Besanko et al., 2010). When there is a learning curve present, costs per unit of output are decreasing when the accumulated total output increases. Note that this is related to economies of scale, but slightly different. When economies of scale are present, average costs and current output are inversely related, whereas average costs and accumulated total output are inversely related in learning economies. When one of the merging firms has moved further down the learning curve than the other firm because it has more experience in producing the output, this firm will transfer its knowledge, if possible, after a merger. This will allow the less experienced firm to make a jump down the learning curve without producing the output that is normally required in order to come to these insights. Note that although this is an efficiency resulting from diffusion of know-how, this is not a synergy, because the less efficient firm only jumps down the learning curve, without shifting the production function.

2.3.2 Innovation

In order to increase the future value of the company, firms engage in Research & Development (R&D). Developing technologies that lower production costs or increase quality of the products can result in higher future profits. Besides, by innovating a firm might be able to bring a new product to the market, which could give rise to first-mover advantages[10]. Since this thesis focuses on the efficiency effects resulting from the merger, the most interesting innovations are those that result in lower production costs.

There are four innovation-improving effects that result from a merger. First, when two (or more) firms merge, the firm faces fewer competitors in the marketplace than the competing firms did before the merger. When there are fewer competitors, the benefits resulting from R&D can be more effectively appropriated, because there are fewer rivals that can imitate the innovation (Motta, 2004). This makes investment in R&D more attractive. Second, firms can more easily get a loan to finance R&D when they have more assets. The reason for this is that the capital markets do not work perfectly in the sense that lenders are not always able to identify the creditworthiness of the borrowers. When lenders do not know the borrower's ability to pay the debt obligations, they will use screening devices in order to identify the "good borrowers" (Stiglitz and Weiss, 1981). One of these screening devices is the amount of

[10] First-mover advantages: Advantages gained by being the first firm that serves a specific market segment.

collateral the borrower has[11]. Since a merger leads to larger firms with more collateral assets, the firm will have access to more loans to invest in R&D. As will be discussed later on, mergers also change the values of other screening devices to the benefit of the merged firms. Third, there will be an increased incentive to innovate when the merger results in an increase in market power (Besanko et al., 2010). By having more market power, a firm is able to increase its prices and profits. With higher profits, the dominant firm has a lot to lose from the entry of another firm, because this entrant will both take business away from the dominant firm and drive down prices. When innovating discourages entry of rival firms, the increase in market power resulting from a merger may give rise to larger incentives to invest in R&D (Motta, 2004). Finally, as discussed before, the increased incentive to specialize workers in the merged firm might give rise to increased innovation, because workers gain more insights into one specific part of the production process (West, 1964).

2.4 Purchasing Economies

When firms become larger, their bargaining position improves. As a result of this, the merged firm is able to enforce lower costs without being more productive. Note that this efficiency gain can be seen as a form of scale economy. The reason why purchasing economies are discussed separately is that the European Commission also discusses it as being a different efficiency than scale economies when assessing a merger. A better bargaining position can result in lower input prices or lower cost of capital and both will be treated independently.

2.4.1 Stronger Bargaining Position for Inputs

Almost every firm requires inputs that need to be bought from an upstream supplier. Often, the upstream supplier charges a mark-up over its costs in order to make a profit and to pay fixed expenses. When a supplier becomes more dependent on one downstream firm, it is more willing to lower its mark-up and accept more favourable terms for the downstream firm in order to retain this customer; this means that the downstream firm has more buyer power. When a firm becomes larger as a result of a merger, a single firm demands more inputs and so its suppliers are more reluctant to lose this firm as a customer. The downstream firm can exploit this position by threatening to move businesses from the current supplier to other firms or potential entrants, or it can threaten to start businesses in the upstream market itself (Motta, 2004). Also, large firms are more able to influence government policy, because they

[11] When the borrower has a lot of assets that can serve as collateral, in case of default on debt repayments, lenders can sell the collateral and thereby recover a large part of their investment.

generally have more lobbying power (Delens, 2005). For large firms there is more at stake, because their net worth changes resulting from a specific policy will be larger in absolute terms than for small firms. Consequently, the large firms are willing to spend more financial resources on lobbying in order to influence government policy.

2.4.2 Stronger Bargaining Position for Cost of Capital

Due to the imperfect capital market, lenders are not always able to estimate profitability of a project undertaken by a borrower. Resulting from this, the lender is not able to identify creditworthiness of the borrower. Therefore, the borrower does not pay an interest rate that reflects the riskiness of its projects, but faces an interest rate that reflects the estimated risk of its chance of default on debt repayments. When an enterprise becomes larger as a result of a merger, the values of the following screening devices will change to the benefit of the borrowing merged firm, resulting in a lower risk premium. First, as explained previously, a merger results in a larger firm with more collateral assets. For this reason, the firm is perceived to be less risky and hence interest rates charged by the lender will be lower. Second, the large firm will have more and larger cash flows resulting from its operations (Napier, 1989). With this large liquidity, the borrower is more likely to be able to repay its debts, which requires a lower risk premium. Finally, the diversification-effect of the merger lowers the risk of default on debt (D'Anvers, 2005). By merging, the firms reduce the idiosyncratic risk[12], which leads to less volatile revenues, and so the firm is more likely to be able to meet debt obligations (Lubatkin and O'Neill, 1987). Note that although these indicators do tell something about the creditworthiness of a firm, they do not convey any information regarding the profitability of the projects undertaken by the borrower. For this reason capital markets work imperfectly, as ideally small firms should also be able to finance projects with high success rates. In a paper of Muris (1998), empirical evidence is presented that states that billion-dollar businesses enjoy an interest rate that is approximately six per cent lower than firms with 200 million dollars in assets. Moreover, these 200 million-dollar businesses face borrowing costs that are about twelve per cent lower than 5 million-dollar businesses.

Another reason why a merger could give rise to lower capital costs, is that after-merger share prices are generally higher than pre-merger share prices. In fact, Melicher, Ledolte and

[12] Idiosyncratic risk: Firm-specific risk.

D'Antonio (1983) found that share prices already tend to increase before a merger, because investors were demanding more shares of the firms during the merger negotiations. One explanation could be that investors anticipate that the combination of unilateral, pro-collusive, and efficiency effects that result from a merger will increase the profits of the firms in the future. By issuing new shares after the merger, the firm is able to attract more capital than this issuance of shares would attract without the merger.

2.5 Slack Reduction

After a merger, the firm often reorganizes in order to integrate the separate firms. Due to this change of organizational structure, the incentives of the employees to exert effort might be altered, which results in a change in productivity. In this section, it will be discussed in what ways a merger could give rise to an increase in productivity. In the next chapter, a possible decrease in productivity will be discussed, as this is an efficiency loss resulting from a merger.

Satisfied employees are more likely to be willing to exert effort than dissatisfied employees, and so they are expected to be more productive (Judge et al., 2001). Based on a survey performed by Graves (1975), several sources of job satisfaction were identified that result from a merger. First, because there was more work to do after the merger, employees were more satisfied. Especially the reduction of overcapacity resulting from a merger, as pointed out previously, could explain this. Second, the increased scope and variety of the work after the merger made employees more satisfied with their jobs. After the merger, employees are able to work in both firms and so this increases variety of the job. Note that this finding contradicts the argument that a merger increases specialization, because this would result in less variety of the job by making workers focus on fewer processes. Third, workers pretend that working in the larger, merged firm gives rise to more status, responsibility and promotion prospects. Fourth, some workers report being better off financially after the merger. It is not clear whether they earn more because they exert more effort or the merger leads to a higher salary itself. In both cases, it is possible that the merger results in more satisfied workers and more effort. Also noticeable was how especially the younger and unmarried respondents were glad to be working with more colleagues after the merger.

Napier (1989) added the increased job security in the larger, merged firm to the sources of job satisfaction described by Graves. As discussed previously, larger firms are less likely to go

bankrupt due to their large, frequent transactions and the large amount of assets and liquidity they control. Consequently, when working for a large firm, employees have to worry less about future dismissal due to bankruptcy. Note that this argument, as most other arguments on slack reduction, is also a form of scale economy, because they only relate to the size of the firm. These slack-effects are discussed separately, because several increases of slack that are discussed in the next chapter are very specifically related to a merger and because these effects will be tested separately in the empirical study of this thesis.

Chapter 3: Efficiency Losses Resulting From a Merger

Besides cost efficiencies that result from a merger, the merger could give rise to cost inefficiencies. When a firm expects to be less cost-efficient after a merger, it still has an incentive to merge when the benefits from the unilateral and pro-collusive effects outweigh the cost of the efficiency loss.

For clarity, the cost inefficiencies will mostly be categorized in the same groups as the cost efficiencies discussed earlier. The following sources of inefficiencies are identified and will be discussed separately:

- Merger costs
- Diseconomies of scale
- Impediments of technological progress
- Mistakes
- Slack increase

For the antitrust authorities who have to decide whether to allow a merger, the sources of the cost inefficiencies do not matter as much as the sources of the cost efficiencies. This comes from the fact that inefficiencies are always welfare reducing and in combination with the welfare reducing unilateral and pro-collusive effects, it is certain the merger will be detrimental to welfare. Therefore, when it is obvious that efficiency gains are small or negative, antitrust authorities will forbid the merger.

3.1 Merger Costs

In order to make a merger successful, the participating firms need to invest a considerable amount of financial resources. Before, during, and after the merger, firms need to make costs that relate to the merger.

Before the merger, all parties participate in the merger negotiations. These negotiations are time-consuming and therefore costly. All firms invest time and other resources in it without knowing whether a single agreement will be reached. Even if the firms manage to come to an agreement, it is still uncertain whether the antitrust authorities will approve the merger. Other expenses the managements of the merging companies have to make before the transaction is completed are the costs of informing personnel. The absence of communication prior to the

merger gives rise to uncertainty about the futures of the employees, resulting in lower productivity and more resignations (Schweiger and Denisi, 1991 and Napier, 1989). Firms might avoid this by communicating the anticipated effects of the merger to the employees, because this will reduce uncertainty. On the other hand, communication might spill over valuable information to rivals or make employees only more willing to leave the firm when the anticipated effects are painful. This might make firms reluctant to inform its personnel about the merger. Either way, communicating to employees about the merger increases costs before the merger[13].

When the merger concerns an acquisition, the transaction of the merger itself is very costly. Some firms spend millions of dollars on the takeovers of other firms. Often, the real value of a company cannot be estimated reliably and so the acquirer faces the risk of paying too much for the other firm (D'Anvers, 2005).

After the merger, the firm needs to spend large amounts of money. First, the reorganization often following a merger is costly. These costs mainly come from combining and transferring the assets of the merging firms (Trautwein, 1990). Second, after a merger, employers can increase their future profitability by training their employees (Napier, 1989). By training their employees, an employer can accelerate the diffusion of know-how and thereby enhance synergies and other efficiency gains. Finally, after an acquisition, the firm has to pay back the lenders the money that was borrowed to finance the merger, including interest.

Strictly speaking, the costs mentioned in this section are efficiency losses, because they increase costs per unit of output. Note, however, that these costs do not result from inefficient behaviour, but from increased investments in future profitability.

3.2 Diseconomies of Scale

When an increase in total current output causes higher total costs per unit of output, a firm exhibits diseconomies of scale. In this section, some arguments that explain economies of scale will be criticized. After this, the possible sources of diseconomies of scale will be identified.

[13] Note that communication should not stop when the merger transaction is completed. In order to reduce uncertainty, the firms should always inform their employees about the anticipated effects of their actions.

3.2.1 Critique on Sources of Scale Economies

The extent to which the benefits of scale economies will prevail after the merger depends on the extent of integration of the merging firms. In order to maximize the benefits from scale and scope economies, the merging firms should be combined and managed as if it is one single entity. On the other extreme, when the merged firms continue to operate in the same way after the merger as they did before, scale and scope economies will not be fully exploited.

Often, the benefits mentioned that result from spreading the fixed costs are unrealistic. It is not always possible to shut down a department in order to reduce the duplication of fixed costs and overcapacity. It is especially difficult to lay off excess personnel, because this will result in bad publicity that harms the firm or because it is not possible due to legislation and contracts (Resti, 1998). As a result, the firm cannot reduce the amount of financial resources spent on personnel as they would perhaps like and the best the firm can do is to re-assign existing employees in the most profitable way. Besides, the reorganization following the merger often results in dismissals of managers and other employees. When they leave the firm, so will their know-how, skills and experience (Delens, 2005). Even though the dismissals lead to a reduction of costs in the short-run, the shortage of experienced workers might decrease the cost-efficiency of the firm in the long-run.

3.2.2 Sources of Diseconomies of Scale

When an organization grows larger, its complexity increases with more committees, departments, and managers, making communication in the firm more difficult (Graves, 1975). Also, monitoring the activities of the workers becomes more costly, because there are more workers responsible for a specific part in the production process and so allocating output to individuals becomes more difficult, if not impossible. Besides, when there are more managers, it is more difficult to come to a single agreement. This can result in costly and indecisive management of the larger firm and hence the firm is less able to adapt to a changing market environment (Delens, 2005).

In general, large firms pay higher wages and provide greater benefits (Besanko et al., 2010). Large firms are likely to pay higher wages for the following reasons. First, large firms have a

greater chance of being unionized[14]. When workers are organized, they are more able to enforce higher wages and other benefits than when they are on their own. Second, workers in large organizations might enjoy their work less and therefore demand a higher salary when they work for a large firm. The reasons why workers find it less attractive to work for a large firm will be discussed in the section regarding slack. Finally, because large firms need more workers, they also need to attract workers from a greater distance. In order to attract workers that live further away from the firm, a higher salary might be required.

Finally, the merger could result in a larger increase in output than the specialized resources are able to produce efficiently. Subsequently, these resources will be spread too thin in the organization, which is inefficient (Besanko et al., 2010).

3.3 Impediments to Technological Progress

There are several ways in which a merger results in decreased incentives to innovate and engage in R&D. This lowers the potential of the firm to benefit from technological progress and might leave opportunities to lower future costs unexploited. First, firms with more market power have fewer incentives to innovate, because the innovation will cannibalize more profits, meaning that some current profits will only be replaced by profits resulting from the innovation, which makes the investment less attractive (Grimpe and Hussinger, 2008). This is also referred to as Arrow's Replacement Effect. Since a merger generally leads to an increase in market power, the merger makes the firm less willing to invest in innovation. Second, as discussed before, specialization of personnel is more attractive after the merger due to economies of scale. According to Adam Smith in "The Wealth of Nations" (1776), the division of labour makes workers become "as stupid and ignorant as it is possible for a human creature to become". He also argued that the division of labour enables workers to acquire dexterity "at the expense of his intellectual, social and martial virtues" (West, 1964). This might suggest that after specialization there will be no incentive to think about new ways to change production and hence innovation will be discouraged. Also, when everyone is focusing only on their own specific part of the production, synergies are less likely to be exploited, because there will be less interactions that make synergies occur. Finally, the firm might still not be able to reap the benefits from introducing new products and production processes resulting from a synergy. This comes from the fact that competitors quickly imitate

[14] Note that the applicability of this argument depends on the country that is investigated.

these products and processes as soon as they hear about the innovations that yield significant advantages (D'Anvers, 2005 and Kattan, 1993). Consequently, the imitators can gain from the innovations, without having the pain of the large R&D costs. Note that this spill-over effect does not result from a merger itself, but is a general market condition that makes innovation less attractive. In order to remove this impediment to innovation, the government should introduce better-defined and protected intellectual property rights.

Another reason why a merger could lead to less technological progress is that the diffusion of know-how might go the wrong way: from the less efficient firm to the more efficient firm (Resti, 1988). Considering a take-over, when the management of the inefficient buyer replaces the management of the efficient target (the firm that is taken over), the superior know-how, experience and skills of the targets' managers will be lost. Also, when the acquiring firm determines the new policy and it sticks to the inefficient policy implemented before the merger without making use of the knowledge of the efficient firm, a suboptimal outcome will arise.

3.4 Mistakes

A merger might result in inefficiencies, because the management made decisions regarding the merger that later appeared to be sub-optimal. First, considering a take-over, the acquirer might have overestimated the synergy effects or the difficulty of integration, which made him willing to pay more for the acquisition than was actually optimal, resulting in large future debt repayments. Another reason why the buyer might pay too much for the acquisition is due to asymmetric information; the buyer might not exactly know the risks and internal problems the target faces before the transaction and therefore it is willing to pay too much (D'Anvers, 2005). Second, during the reorganization of the firm that often occurs after a merger, there are many strategic decisions that could be regretted in hindsight. For instance, if the acquirer mistakenly fired the successful managers that would be responsible for the synergies, the cost reductions resulting from the merger would be smaller than anticipated. Third, due to asymmetric information, the acquirer might find out after the transaction that it lacks the skills and knowledge that are needed to run the firm. As a result, the acquirer is forced to operate at higher costs or to sell the firm again, probably at a lower price (D'Anvers, 2005).

Another mistake the firms could make, is the mismatch of corporate cultures[15]. This effect is often underestimated, but is likely to be very significant, because it affects the every day business of the firm (Weber and Camerer, 2003 and Napier, 1989). Even though some differences could give rise to synergies, when the cultures of the firms are too different, this might result in misunderstanding and difficulties to create a "common language". This lowers the potential to realize synergies and decreases the productivity of the employees (Ramaswamy, 1997). Since corporate culture is difficult to measure, buyers often ignore it in the decision making process of the acquisition and so they pay too much when there is little cultural fit.

3.5 Slack Increase

As discussed before, when the organizational structure is changed by the reorganization following a merger, the incentives of the employees to exert effort might be altered. In this section, it will be discussed in what ways a merger might lead to lower productivity of the workers. First, it will be discussed how a merger could lower incentives to work, making employees more lazy. Second, the increased incentives to act in the workers' own interests (rather than those of the firm) following a merger will be explained.

3.5.1 Lazy Workers

Based on the same survey results of Graves (1975) that were discussed previously, there were also sources of job dissatisfaction identified that make workers less willing to exert effort. First, by far the most respondents did not like the more formal and impersonal environment that often resulted from the merger. Second, possibly because of this, they felt less loyal to the firm. Third, some workers reported problems related to cooperation that arose after the merger. Since there are more people working in the merged firm, more workers have to work together, making cooperation more difficult. Fourth, workers reported less scope and variety of the job. The specialization argument discussed earlier might explain this finding, as specialized workers only focus on a small part of the production process. Fifth, some respondents claimed that promotion prospects were decreased, because of the increased number of highly educated workers and a more elaborate organizational structure after the merger. Finally, the increased friction and confusion resulting from a merger were another source of job dissatisfaction. Note that some sources of job dissatisfaction were also

[15] Corporate culture: The ideals, norms and conventions of behaviour that are usually different in each company.

mentioned as sources of job satisfaction. As this survey is based on personal opinions, different preferences could explain this finding.

Related to diseconomies of scale, the larger firm resulting from the merger is less able to offer contracts that attract top talent and motivate workers than the smaller firms before the merger (Zenger, 1994). This comes from the fact that costs to measure performance tend to be lower for smaller firms and therefore they are more able to offer contracts that link the performance of the employees to their wage. In a small firm, the manager is more able to distinguish individual performance from team performance and so individual performance pay is more feasible. When pay is more related to output, the firm will attract more highly motivated and skilled personnel and it will motivate existing employees to exert more effort.

There are also other reasons why workers are less willing to exert effort after a merger. Since the merger reduces the number of rivals, the market will be less competitive after the merger. This might bring about managerial X-inefficiency in the sense that less effort of the managers will be required in order to keep up with the competition and to make the firm continue to exist (Motta, 2004). Second, mergers generally give rise to extra uncertainty regarding future employment. This makes workers less willing to exert effort and this effect is referred to as "the merger syndrome" (D'Anvers, 2005).

3.5.2 Act in Own Interest

It is claimed that hierarchy results from the fact that employees possess different private knowledge (McAfee and McMillan, 1995). Individuals might exploit this private knowledge by using it to influence decisions to their private benefit (Rasmusen and Zenger, 1990). Since the hierarchical model of a larger firm has more layers and is more complex, it is argued that a merger increases influence costs[16].

Also, the uncertainty regarding future employment makes managers more willing to focus on the short-term pay-outs of their effort than on the long-term pay-outs. However, if investing in long-term projects would be profit maximizing, this behaviour makes the firm less efficient.

[16] Influence costs: The costs associated with the exploitation of private knowledge and the costs the firm makes to avoid it.

Chapter 4: Empirical Research

4.1 Introduction

4.1.1 Sector Description

With almost one out of every three dwellings owned by housing corporations in the Netherlands, these corporations play a very important role in today's society. Dutch housing corporations are non-profit firms that build, manage and rent out affordable and high-quality dwellings. There are more than 400 corporations that are active in the Dutch housing market and they collectively own more than 2.4 million dwellings with a total value of around €207 billion (CFV, 2010).

The corporations have been decentralized since 1995, but still pursue a social objective; guarantee that those who have difficulties with finding living arrangements, for instance the disabled or those with low incomes, will be given the opportunity to rent a dwelling[17] (Aedes, 2007). Interestingly, housing corporations are not allowed to act completely independent from the government, but are strictly regulated. This makes the market for social houses a quasi-market; positioned between the state and the free market (Dekker, 2009). Since it has appeared to be too costly and inefficient to let the government provide these dwellings, this task has been assigned to the market. However, in order to make sure that the market continues to pursue the social objectives, regulation is required. Corporations need ministerial approval in order to implement major projects and have to follow the Housing Act rules (Verhaegh et al., 2012). Also, a corporation needs to meet specific requirements imposed on them by the government.

The Housing Act rules specify the following six objectives that the corporations are expected to pursue (Aedes, 2007) [18]:

- Provide housing to the groups of people that are not able to find their own housing
- Provide dwellings of high quality
- Consult tenants regarding important decisions
- Make sure that the corporation is financially able to continue to exist in the future

[17] These groups of people have difficulties with finding proper housing themselves, because landlords consider them to have a higher probability of default on their payments. Hence, they are less willing to invest in building dwellings for them (Priemus, 2010).
[18] Source: http://www.quintis.nl/product.php?id=53 (13-05-2012).

- Improve quality of life in the neighbourhoods
- Adapt housing to the requirements of the persons in need of care

Besides renting out dwellings, housing corporations also engage in the sale of their dwellings. Currently, this is only a minor operation of the corporations; about 0.6% of all social dwellings are sold per year (Verhaegh et al., 2012). Housing corporations tend to undertake additional projects that are usually very costly. Often, these projects face much criticism by the public, because they result in an outflow of financial resources from the social housing sector (Dekker, 2009). For example, in 2008 the corporation Woonbron bought the ship SS Rotterdam and turned it into an event center with a restaurant and hotel. This project turned out to be so costly (costing more than €250 million), that Woonbron found itself in economically heavy weather as a result (Metro, 07-06-2011)[19].

4.1.2 Housing Corporations and Mergers

As a result of mergers between corporations, the corporations are decreasing in number. In fact, the reduction in number of corporations of the last years is fully due to mergers (CFV, 2010). The decreased willingness of banks to lend money to housing corporations is a suggested reason for this large amount of mergers. A merger between a cash-rich and a cash-poor corporation gives rise to more liquidity for the cash-poor corporation and increased investment opportunities for the cash-rich corporation, making the merger attractive to both parties. The development of the amount of corporations from 1998 to 2009 can be found in *Figure 1 of the Appendix*.

Since the corporations are strictly regulated and non-profit firms, the antitrust authorities do not have to worry too much about the unilateral and pro-collusive effects of a merger. On the other hand, the efficiency effects are very important, because these will affect the prices charged by the corporations to the (low-income) tenants[20]. Since these prices affect the amount of dwellings rented out to the groups of people that are not able to find their own housing, the extent to which the corporations are able to meet their objectives depends on the efficiency effects of a merger. Therefore, corporations should only be willing to merge if this results in significant cost savings. This might be a reason why the government rarely

[19] Source: http://www.metronieuws.nl/nieuws/megaverlies-voor-ss-rotterdam/SrZkff!2O76oMhSXb6g/ (13-05-2012).
[20] Even though the pricing policy is (partly) regulated by the government, prices are likely to go down when costs decrease.

disapproves of a merger, even without requiring the merging parties to precisely specify the anticipated costs savings (CFV, 2010). However, motives to merge might not always be this honest. First, since the corporations are private organisations, they are allowed to pay their management personnel a form of incentive-based payment. The compensation of the managers largely depends on the amount of dwellings that the corporation owns (Koolma, 2010). According to the empire-building theory, managers have an incentive to merge, because it will increase their payoff by increasing the size of the firm (Trautwein, 1990). Apart from increased financial compensation, the manager of the larger firm might enjoy other personal benefits, such as increased prestige (Brouthers et al., 1998). Second, a larger corporation benefits from other advantages than costs savings alone; for example, higher chance of acquiring construction sites from the government (Aedes, 2007). These other motives make it less likely that managers will base their decision to merge on merger-specific efficiency gains and so there will be lower chances that these types of efficiency gains will arise after the merger.

4.1.3 Goals and Hypotheses of Empirical Research

In the empirical section of this thesis, I test whether the scale effects discussed in chapters 2 and 3 prevail in the market of the housing corporations. Since the data available does not allow me to directly investigate the effects of a merger, only the scale effects will be discussed. Besides the effects that were discussed in the sections "(dis)economies of scale", many benefits and costs resulting from purchasing economies and slack effects were also related to scale. As discussed in the previous section, other motives to merge make managers less likely to focus on the merger-specific efficiency gains resulting from a merger. Therefore, the scale effects (that are not merger-specific) are likely to be the most important efficiency effect that results from a merger.

First, it will be investigated whether average net total expenses (from now on abbreviated to ANTE) change when the number of dwellings owned by the corporation increases. Since in the literature study of this thesis it was found that there are many reasons why the scale of a firm affects costs and most of these reasons can be applied in the sector of the housing corporations, I expect scale effects to be present in this market. Since there are reasons to think that both economies of scale and diseconomies of scale can arise, the sign of this effect is still ambiguous.

Hypothesis 1: The ANTE of the Dutch housing corporations depend on the number of dwellings that they own.

Second, when the ANTE depend on the number of dwellings owned, it might be interesting to find out whether these scale (dis)economies affect variable costs or fixed costs. Since the variable costs of housing corporations mainly consist of maintenance costs and personnel costs, it can be investigated whether average variable expenses (from now on abbreviated to AVE) depend on the scale of the corporation. In a study based on the housing corporations in 2002, it was found that personnel costs per dwelling increased when scale increased, which indicates a diseconomy of scale (Koolma, 2010). On the other hand, a larger corporation might have lower variable costs due to bulk discounts or by enforcing lower contract costs for maintenance, because the maintenance firms are more reluctant to lose this large corporation as a customer. In the research of Koolma, maintenance costs appeared not to depend on the scale of the housing corporation. Therefore, I expect that variable costs positively depends on the output in this market.

Hypothesis 2: The AVE of Dutch housing corporations increase when the number of dwellings that they own increases.

Third, the productivity[21] of the employees is further investigated. As discussed before, a previous study found a positive relationship between the scale of the corporation and the variable costs per dwelling, which might indicate that workers become less productive in a large firm. However, this effect might also come from higher average wage costs and average maintenance costs of larger corporations. Productivity is interesting to analyse, because it does not depend on wage and maintenance costs and therefore it provides a more objective measurement of employee performance than the AVE. Productivity changes that are caused by an increase in scale could be explained by a slack increase or decrease and specialization. Based on the study of Koolma, I still expect that employees in a smaller corporation are more productive.

Hypothesis 3: The productivity of the employees of Dutch housing corporations decreases when the number of dwellings that the corporations own increases.

[21] Productivity: The amount of dwellings that the corporation owns divided by the amount of fulltime employees.

Fourth, as a managerial implication, it might be interesting to know whether being more cost efficient is desirable from the point of view of both the firm and the customer. Optimally, efficiency and quality are positively related and the corporation provides higher quality at lower costs. However, when cost efficiencies come at the cost of quality, an efficiency gain might make the firm worse off by resulting in a loss of customers in the long-run, even though the cost reduction itself is beneficial to firms in the short-run. Carey and Burgess (1999) argued that there is an efficiency-quality trade-off in the health care industry, because quality is costly. This trade-off might also be present in the housing industry.

Hypothesis 4: The assessed quality of the service of the Dutch housing corporations decreases when their ANTE increase.

Finally, it might be interesting to know whether larger corporations provide services of higher quality than small corporations. Since larger corporations might signal higher quality[22], scale of the corporation could positively affect their perceived quality (Hellofs and Jacobson, 1999).

Hypothesis 5: The quality of the service provided by Dutch housing corporations increases when the number of dwellings that they own increases.

4.2 Data Description

The conclusions that are made in this data-analysis will be based on a combination of the data acquired by Deloitte Real Estate Advisory and Kwaliteitscentrum Woningcorporaties Huursector (KWH). Deloitte is a multinational firm that provides other firms with professional advisory services and is active all around the globe. Deloitte advises all parties that are active in the housing sector and willing to achieve their corporate goals in a way that is consistent with societal values[23]. Since Deloitte advises many firms that are active in the housing sector, the firm has obtained a lot of information about the costs and other characteristics of the housing corporations. This data is directly received from the governmental body Centraal Fonds Volkshuisvesting (CFV) that collects these data of every corporation. KWH is a company that assesses the quality of the service provided by housing

[22] Customers might think: "If the corporation is that large, than their services should be good".
[23] Source: http://www.deloitte.com/view/nl_NL/nl/branches/real-estate/woningcorporaties/index.htm (14-05-2012).

corporations by allocating them recognized labels. These assessments are based on qualitative data acquired via questionnaires from the corporations and their customers. Additionally, the company ranks the different housing corporations by benchmarking them against other corporations. By this means, the corporations are informed about what their strengths and weaknesses are so they learn where there is opportunity for improvement.

These companies have agreed to provide the dataset I require for this research, but (for confidentiality reasons) I am only allowed to describe the data in an abstract form. The very large amount of observations[24] makes this dataset very unique and valuable. However, KWH has not assigned a quality label to all these corporations, because not all housing corporations are member of KWH. Deloitte recently started with collecting the data of the corporations; therefore it only provided data for the period 2008-2010. In *Table 2*, the variables of the relevant data that is available are highlighted and in *Table 1* a summary of this data of 2010 is provided.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
ANTE	394	494	2640	1284.50	292.82
Complaints Maintenance	393	49	986	300.12	143.68
Mutation Maintenance	372	5	939	180.09	149.76
Systematic Maintenance	393	45	4992	904.26	541.63
Personnel	353	174	1506	670.10	170.17
Productivity	353	36	345	106.87	39.32
Quality	170	7.13	8.34	7.77	0.20
Scale	396	22	88626	6517.55	10712.89
Handicapped	396	0.0	100	18.70	16.26
Accessible	396	0.0	100	27.80	15.51
WOZ	396	63630	317437	161313.55	35404.88

Table 1

[24] Almost every Dutch housing corporation is listed in this dataset.

Variable Specifications	
ANTE	Total expenses in euros per dwelling (investments are not included) minus compensations and other operating income per dwelling.
Complaints Maintenance	Total expenses required as a result of complaints or maintenance requests by the tenants in euros divided by the amount of dwellings owned.
Mutation Maintenance	Total maintenance costs that are required in order to make vacant housing units suitable for rental in euros divided by the amount of dwellings owned.
Systematic Maintenance	Other (planned) maintenance costs in euros divided by the amount of dwellings owned.
Personnel	Total costs of personnel in euros, divided by the amount of dwellings that the corporation owns.
Productivity	The amount of dwellings that the corporation owns, divided by the amount of fulltime equivalents.
Quality	Value of the quality label of the service that is assigned to the corporations by KWH based on qualitative data acquired via questionnaires.
Scale	Number of dwellings owned by the corporation in units. Assets other than dwellings are not included in this figure.
Handicapped	Share of dwellings (in per cent) that is designated for the handicapped people and the people that are older than 55 years.
Accessible	Share of dwellings (in per cent) that has no stairs.
WOZ[25]	Average value of the dwellings in euros. The WOZ-value of a dwelling is yearly estimated by local authorities and is used for taxation purposes.

Table 2

4.3 Procedures

4.3.1 Methods

I will create the variable "AVE" by summing all the variable costs per dwelling ("Complaints Maintenance", "Mutation Maintenance", "Systematic Maintenance" and "Personnel").

By making use of a regression analysis, every hypothesis will be statistically tested. In each section that tests a hypothesis, the same steps will be undertaken in order to find out whether the independent variables significantly affect the dependent variable (these variables are

[25] WOZ stands for: Waardering Ontroerende Zaken.

discussed in the next section). Observations with missing values for at least one variable will be removed listwise from the dataset on which the regression is based. Since KWH has recorded more quality labels in the most recent year (N=170) and this most recent data is more likely to be conforming to current legislation, the conclusions of the data-analysis will be based on the observations of 2010. Given the number of observations, it can be assumed that a 5% significance level is appropriate[26]. In order to test the hypotheses, two-sided tests will be used, because the signs of the coefficients are uncertain.

First, based on the scatterplots and the correlations between the dependent and independent variables that are mentioned in the hypotheses, possible relations will be explained. By making use of a simple regression, the sizes of these relations will be discussed.

Second, it will be tested whether the significant effects found in the simple regression remain significant when more independent control variables are added (the control variables are discussed in the next section). If this is the case, it is more certain that the independent variable that is investigated affects the dependent variable. Also, the joint significance of the variables that appear to be insignificant will be estimated by making use of an F-test. If the full model significantly explains greater part of the total variance than the restricted model that only includes the significant variables, the insignificant variables are still jointly useful in explaining the dependent variable. Since the conclusions that can be made about the model depend on whether the underlying assumptions of the regression are met, these assumptions should be tested for. I will test whether the assumptions of normally distributed residuals, homoscedasticity, linearity, independent errors and no multicollinearity are met. In *Figure 2 of the Appendix* the assumptions and the techniques that will be used to test them are discussed in greater detail.

Third, if some assumptions of the estimated model appeared to be violated, I will try to improve the model by transforming the variables. By taking the natural logarithm of all or only the dependent variables, more concentrated values are created that might alleviate violation of the assumptions. As in the previous analysis, I will start with a simple regression and subsequently add more independent control variables in order to check the robustness of the results. The observations with the value 0 for one of the variables will be removed

[26] Even though this choice is quite arbitrary, this is the conventional value that I accept to be relevant.

listwise, because Ln(0) has a non-existent value. In order to enhance comparability, I will repeat the simple regression with only the observations that are included in the full model and I will report any significant deviations.

An F-test will be performed to test for the joint significance of the variables that turned out to be insignificant in explaining the dependent variable and the assumptions of the full model will be tested.

Finally (in the discussion), based on the estimated models and their R-squares, the expected relationships between the variables will be explained and the importance of the independent variables in explaining the dependent variables will be discussed.

4.3.2 Variables

The dependent variable of the model that is estimated in order to test the first hypothesis is "ANTE", because this is the variable that needs to be explained. The effect of the number of dwellings owned by housing corporations on the ANTE is investigated and therefore "Scale" will be considered as one of the independent variables. Also, some other characteristics of housing corporations might explain part of their ANTE. It is conceivable that people living in accessible dwellings and dwellings designated for handicapped and aged people require special attention. Also, the maintenance costs of these dwellings might be higher. Therefore the variables "Handicapped" and "Accessible" should be considered to be included as independent control variables in the model. Besides, the average value of the dwellings owned might be an important variable in explaining the ANTE. For instance, more expensive houses could lead to higher maintenance costs, because they are generally larger. Therefore, the independent control variable "WOZ" should be included in the model.

In the model that will be estimated to test the second hypothesis, "AVE" will be the dependent variable, because this variable will be explained. The variables "Scale", "Handicapped", "Accessible" and "WOZ" will be entered as independent variables of the model for the same reasons as were discussed in the previous paragraph.

In order to test the third hypothesis, a model will be used with "Productivity" as the dependent variable. Since the effect of scale on productivity is investigated, "Scale" will be an independent variable. It is conceivable that handicapped, aged and inaccessible customers

require more special attention of employees (leading to lower productivity), therefore "Handicapped" and "Accessible" should be considered as independent control variables of the model. Customers that live in an expensive dwelling could require more (or less) services of the employees and so it might also affect productivity. Therefore, "WOZ" should be entered into the model as an independent control variable.

Finally, the model that will be used to test the last two hypotheses will have "Quality" as dependent variable. Since the effects of "ANTE" and "Scale" on "Quality" are investigated, these variables should be included as independent variables. As discussed earlier, "ANTE" might also depend on "Handicapped", "Accessible" and "WOZ". Therefore these variables should be considered to be included as independent control variables in the regression. Also, "Productivity" could be a relevant independent control variable, because more productive workers might be more satisfied and therefore they are likely to act more friendly and assisting to customers, resulting in higher assessed quality (Goldschmidt and Chung, 2001).

4.4 Results

In this section, the hypotheses will be tested by cross-sectionally comparing the Dutch housing corporations in the way that is described previously. The effects of scale and other characteristics on performance measures will be combined in order to isolate their partial effects. Every hypothesis will be tested and discussed separately. The models that will be referred to can be found in *Tables 4 and 5*[27].

Correlation Coefficients[27]				
	ANTE	AVE	Productivity	Quality
Scale	0.149 (0.003)	0.102 (0.055)	-0.272 (0.000)	-0.456 (0.000)
Handicapped	-0.053 (0.294)	-0.030 (0.575)	-0.009 (0.868)	0.213 (0.005)
Accessible	0.041 (0.413)	0.066 (0.213)	-0.153 (0.004)	-0.058 (0.455)
WOZ	0.038 (0.449)	0.069 (0.194)	0.152 (0.004)	0.172 (0.025)
ANTE				0.026 (0.734)
Productivity				0.296 (0.000)

Table 3

[27] The values in brackets are the 2-tailed significance levels.

Models								
M	1	2	5	6	9	10	13	14
	ANTE		AVE		Productivity		Quality	
Constant	1257.93 (0.000)	1147.42 (0.000)	1931.30 (0.000)	1620.82 (0.000)	113.83 (0.000)	99.614 (0.000)	7.757 (0.000)	7.315 (0.000)
Scale	0.004 (0.003)	0.004 (0.006)	0.005 (0.055)	0.005 (0.075)	-0.001 (0.000)	-0.001 (0.000)	$-8.630E^{-6}$ (0.000)	$-6.703E^{-6}$ (0.000)
Handicapped		-1.586 (0.194)		-2.809 (0.298)		0.246 (0.208)		0.003 (0.023)
Accessible		1.949 (0.123)		4.609 (0.083)		-0.521 (0.007)		-0.001 (0.667)
WOZ		0.001 (0.220)		0.001 (0.120)		0.000 (0.029)		$8.056E^{-7}$ (0.089)
ANTE							$6.541E^{-5}$ (0.210)	0.000 (0.045)
Productivity								0.002 (0.007)
R^2	0.022	0.032	0.010	0.026	0.074	0.108	0.215	0.256
Adj. R^2	0.020	0.022	0.008	0.014	0.071	0.098	0.206	0.234
N	394	394	353	353	353	353	170	170

Table 4

Transformed Models								
M	3	4	7	8	11	12	15	16
	Ln(ANTE)		Ln(AVE)		Ln(Productivity)		Ln(Quality)	
Constant	6.830 (0.000)	5.219 (0.000)	6.989 (0.000)	4.381 (0.000)	5.638 (0.000)	5.186 (0.000)	2.106 (0.000)	1.939 (0.000)
Ln(Scale)	0.038 (0.000)	0.030 (0.002)	0.068 (0.000)	0.056 (0.000)	-0.124 (0.000)	-0.119 (0.000)	-0.015 (0.000)	-0.012 (0.000)
Ln(Handicapped)		-0.003 (0.846)		0.016 (0.487)		-0.017 (0.428)		0.004 (0.197)
Ln(Accessible)		0.015 (0.525)		0.072 (0.023)		-0.036 (0.216)		0.003 (0.380)
Ln(WOZ)		0.138 (0.019)		0.204 (0.008)		0.048 (0.501)		0.007 (0.476)
Ln(ANTE)							0.010 (0.230)	0.009 (0.348)
Ln(Productivity)								0.011 (0.287)
R^2	0.055	0.041	0.074	0.091	0.249	0.256	0.313	0.327
Adj. R^2	0.053	0.030	0.072	0.080	0.247	0.247	0.305	0.300
N	394	355	353	329	353	329	170	161

Table 5

4.4.1 Hypothesis 1: Total Efficiency Explanations

After creating a scatterplot, there seems to be a positive relationship between the scale and the ANTE of the corporations. This finding is supported by a small (0.149), but significant (p-value of 0.003) correlation between these two variables. This might suggest that diseconomies of scale are prevalent in the housing market. As can be seen in *Table 3*, the other characteristics of the housing corporation are not significantly correlated with total expenses and so this might suggest that they do not have any explanatory power. The model that results from the simple regression (M1) reveals that for each extra dwelling that the corporation owns, the ANTE increase by €0.004. Even after controlling for other characteristics of the corporations, the significant and slightly positive effect of scale on the ANTE lasts (M2). The other characteristics of the corporations appear not to have significant additional explanatory power in explaining the ANTE.

Even though these other characteristics were not significant by themselves in explaining "ANTE", they might be jointly significant. However, the F-test gives an insignificant p-value (0.257) of the joint significance of these characteristics and therefore it can be concluded that they are not jointly significant in explaining "ANTE".

There is no reason to conclude that the assumptions of normally distributed residuals and linearity are violated. Also, errors are likely to be independent (Durbin-Watson value of 1.943) and multicollinearity is unlikely (all VIF's are 1.732 or lower). However, the assumption of homoscedasticity is possibly violated, because the variance of the standardized residuals is not constant over the full range of standardized predicted values. Since not all assumptions are likely to be met, the results of the regression should be interpreted with care; even though the model still applies to the data that is investigated, the results cannot be generalized beyond the sample. Therefore, it is worthwhile to transform the data in order to find a model that does meet all assumptions.

By taking the natural logarithm of all variables and by using them in a regression, the models M3 and M4 result. Model M3 reveals that scale is still significant in explaining the ANTE; a 1% increase of scale is associated with a 0.038% increase in the ANTE and therefore 0.038 is the elasticity of "ANTE" with respect to "Scale"[28]. After controlling for the other

[28] This relationship remains approximately the same when only the complete observations of model M4 are included.

characteristics of the corporations, both size of the corporation and average value of their dwellings significantly explain part of the variance of the ANTE (M4). The model reveals that a 1% increase of scale is associated with a 0.030% increase in the ANTE. The effect of "WOZ" on "ANTE" seems to be relatively larger; a 1% increase of the average worth of the dwellings results in a 0.138% increase in the ANTE.

From the resulting insignificant p-value (0.809) of the F-test, it can be concluded that the variables "Ln(Accessible)" and "Ln(Handicapped)" are not jointly significant in explaining "Ln(ANTE)".

Again, the Durbin-Watson value (1.816) and the VIF's indicate that the assumptions of independent errors and no multicollinearity are not likely to be violated. Also, there is no reason to assume that any of the other assumptions is violated. Therefore, this regression model (M4) is more appropriate for generalization than the previous model (M2).

4.4.2 Hypothesis 2: Efficiency Explanations of Variable Costs

Even though the scatterplot might suggest a positive relationship between the variables "Scale" and "AVE", the correlation coefficient suggests otherwise (p-value of 0.055). The insignificant effect of scale on the AVE remains when there is controlled for the other characteristics of the corporations (M6). Also, all independent control variables are not significant by themselves in explaining the AVE. The independent variables that were included in model (M6) have no joint significance either, because the F-test gave an insignificant p-value (0.060). The only assumption that is possibly violated is the assumption of homoscedasticity.

By taking the natural logarithm of all variables and by using them in a regression, the models M7 and M8 result. Model M7 shows that this time scale is significant in explaining AVE; a 1% increase in scale results in a 0.068% increase in the AVE[29]. When there is controlled for other characteristics of the housing corporations, the significant effect of scale on the AVE remains (M8). Also, "Accessible" and "WOZ" seem to be significant in explaining the AVE. The effect of "WOZ" on "AVE" is relatively large; a 1% increase in average value of the dwelling results in a 0.204% increase in the AVE. "Accessible" has a smaller effect on

[29] This relationship remains approximately the same when only the complete observations of model M8 are included.

"AVE"; a 1% increase of the share of accessible houses owned results in a 0.072% increase of the AVE.

The Durbin-Watson value (2.158) and the VIF's indicate that the assumptions of independent errors and no multicollinearity are not likely to be violated. However, the assumptions of normally distributed residuals and homoscedasticity are possibly violated. Since this means that the results cannot be generalized beyond the sample, the result should be interpreted with caution.

4.4.3 Hypothesis 3: Productivity Explanations

After creating a scatterplot, there seems to be a negative relationship between the variables "Scale" and "Productivity" and this finding is supported by a negative (-0.272) and significant (p-value of 0.000) correlation between these two variables. However, as can be seen from the scatterplot it is questionable whether the assumption of linearity is met, because the relation between scale and productivity seems to be non-linear. In *Table 3*, the other correlation coefficients can be found and it can be concluded that productivity also seems to be related with the share of accessible dwellings and the average value of the dwellings. The model that results from a simple regression (M9) reveals that, on average, for each extra dwelling that the corporation owns, every fulltime employee is responsible for 0.001 dwellings less. After controlling for other characteristics of the corporations, the same (small) effect of "Scale" on "Productivity" lasts (M10). "Accessible" and "WOZ" also appear to be significant in explaining "Productivity". The effect of the amount of accessible dwellings that the corporation owns on the productivity of the workers appears to be relatively large; when a corporation owns 1% more accessible dwellings, every fulltime employee is responsible for 0.521 less dwellings. The effect of "WOZ" on productivity seems to be so small, that it is negligible.

Even though the Durbin-Watson value (1.818) and the VIF's (all close to 1) of model M10 indicate that the assumptions of independent errors and no multicollinearity are not likely to be violated, other assumptions are likely to be violated. Especially linearity is a problem, as expected, because the residuals do not follow a random distribution but a more specific pattern.

In order to find a better model, the natural logarithms were taken of all variables and used in a regression. Model M11 reveals that scale still is significant in explaining productivity; when scale increases by 1%, every fulltime employee is responsible for 0.124% less dwellings[30]. After controlling for the other characteristics of the corporations, this effect remains negative and significant (M12). All other variables appear not to be significant by themselves in explaining productivity. The F-test gives an insignificant p-value (0.184) and therefore it can be concluded that they are not jointly significant in explaining the productivity of the employees either.

There is no indication to assume that the assumptions of linearity, homoscedasticity and normal distribution of the residuals are violated. Also, the Durbin-Watson value (2.052) and the VIF's reveal that the assumptions of independent errors and no multicollinearity are likely to be met.

4.4.4 Hypotheses 4 and 5: Quality Explanations

The scatterplot does not indicate a relationship between "Quality" and "ANTE" and this finding is supported by an insignificant correlation between these variables (p-value of 0.734). There seems to be a negative relationship between "Quality" and "Scale" and this finding is confirmed by a negative (-0.456) and significant (p-value of 0.000) correlation between the variables. As can be seen in *Table 3*, the variables "Productivity", "Handicapped" and "WOZ" are also significantly correlated with "Quality". The model that results when only "Scale" and "ANTE" are entered as independent variables reveals that only scale significantly explains quality (M13); for each extra dwelling that the corporation owns, the assessed quality of the corporation decreases by 0.000008630. Therefore, the effect of scale on quality does not seem to be very large.

After controlling for the other characteristics of the corporations, the effect of scale on quality remains significant and negative (M14). This time, the variable "ANTE" does seem to be significant in explaining quality. However, this effect is so small, that it has a parameter of 0.000. Also, the variables "Handicapped" and "WOZ" appear to be positive and significant. Since the F-test gives an insignificant p-value (0.201), the variables "WOZ" and "Accessible"

[30] This relationship remains approximately the same when only the complete observations of model M12 are included.

are not jointly significant in explaining "Quality". The assumptions of homoscedasticity seems to be violated so another model could be more appropriate.

After taking the natural logarithm of all variables and by using them in a regression, the models M15 and M16 result. Model M15 reveals that scale is still significant in explaining quality; a 1% increase of scale is associated with a 0.015% decrease in quality[31]. The ANTE do not appear to be significant anymore in explaining quality. After controlling for the other characteristics of the corporations only the variable "Scale" significantly explains part of the variance of the assessed quality. All other characteristics appear to be insignificant by themselves and jointly insignificant (as the p-value of 0.151 of the F-test indicates). There is no reason to assume that the underlying assumptions of the regression are violated, which makes the model appropriate for generalization.

4.5 Discussion

In this section, the techniques that were used and the results that were found will be discussed in greater detail. First, the results will be analysed, in which each hypothesis-test will be treated separately. Second, the methods that were used will be criticized and finally some recommendations for future research will be provided.

4.5.1 Analysing the Results

4.5.1.1 Hypothesis 1: Total Efficiency Explanations

Based on the estimated models, it can be concluded that diseconomies of scale are likely to be prevalent in the market of the Dutch housing corporations, because the ANTE increase when the number of dwellings owned by the corporation increases. Also, the ANTE increase when the corporation owns more expensive houses. Even though both effects are significant, they are relatively small and they explain very little of the total variance of the ANTE (as indicated by the R-square of 0.041).

4.5.1.2 Hypothesis 2: Efficiency Explanations of Variable Costs

Even though the results seem to be weak, the AVE are higher when a corporation owns more dwellings and therefore the diseconomies of scale found in the previous section possibly come from higher variable costs. Also, the AVE increase when the corporation owns more

[31] This relationship remains approximately the same when only the complete observations of model M16 are included.

accessible and more expensive dwellings. One reason for this might be that these dwellings require more administrative expenses or more maintenance. The existence of the relationship between "Accessible" and "AVE" might be strange, because it was not found in the previous section. Since the AVE are part of the ANTE by definition, the variables that appear to explain the AVE should also (partly) explain the ANTE. There can be many reasons why the relationship between "Accessible" and "ANTE" is absent while the relationship between "Accessible" and "AVE" is present. For instance, compensations or fixed expenses might make the relationship less dominantly present and therefore insignificant. The R-square is low (0.091), therefore the variables "Scale", "WOZ", "Handicapped" and "Accessible" only explain a small part of the total variance of the AVE.

Since the ANTE are based on net expenses and the AVE are based on gross expenses, nothing can be inferred from these equations about the effect of scale on the fixed expenses. Unfortunately, this effect will remain unknown, because there is insufficient data available to estimate this.

4.5.1.3 Hypothesis 3: Productivity Explanations

Based on the estimated models, it can be concluded that productivity and scale are inversely related. The increased slack that results from working in a larger firm might be an explanation[32]. On the other hand, specialization and increased motivation that could result in larger organizations increase productivity[33]. Since the net effect of scale on productivity appears to be negative, productivity reduction that results from the slack increase seems to outweigh the productivity increase that results from increased motivation and specialization. Other characteristics do not appear to be significant in explaining the productivity of the employees. With this simple model, 25.6% of the total variance of productivity is explained (as is indicated by the R-square).

4.5.1.4 Hypotheses 4 and 5: Quality Explanations

From the models, it can be concluded that size of the corporation significantly explains the quality of the service of the housing corporations. When the scale of the corporation increases, the quality of their services generally slightly decreases. The ANTE and the control variables do not seem to significantly explain part of the assessed quality. Even though the

[32] The reasons for this have been discussed in chapter 3.
[33] The reasons for this have been discussed in chapter 2.

full model is a very simplistic representation of reality, it explains a relatively large part of the total variance of the variable "Quality" (as indicated by the R-square of 0.327).

4.5.1.5 Main Effects of Scale and Costs

Based on the empirical evidence, it can be concluded that scale of a housing corporation has a slightly positive effect on both the ANTE and the AVE (indicating diseconomies of scale). Also, scale has a negative effect on both the productivity of the workers and the assessed quality of its services provided (especially the latter effect is very small). The ANTE of the corporations did not seem to explain any part of the quality of their services provided and therefore the efficiency-quality trade-off is not likely to exist in the housing market.

4.5.2 Research Limitations

I recognize that my conducted research has several limitations. First, methods used to test whether the underlying assumptions of the regression were met, were rather arbitrary. Especially the conclusions regarding the assumptions of normally distributed residuals, linearity and homoscedasticity were subjective, because they resulted from visually inspecting graphs. Since the generalizability of the model depends on whether the assumptions are met, different interpretations of the assumption tests result in different conclusions. Second, when the variables were transformed by taking the natural logarithm, the corporations that had the value 0 for one of the variables were removed listwise from the dataset, because Ln(0) has no value[34]. When specific observations are removed, this might affect the results. Since there are relatively few observations with a value of 0 for one of the variables and the investigated effects of the full models and the restricted models are approximately the same, this should not be very problematic[35]. Third, the regressions show relatively small R-squares (especially the regressions that test the first two hypotheses), so it is likely that there other variables that are important in explaining costs and quality, such as location and year of construction of the dwellings. As long as these effects are not included in the model, the real effects cannot be estimated with certainty. Also, the existence of confounding variables might be the only reason why the scale of the corporation significantly affects costs and quality; when these confounding variables are included, the effects of scale on costs and quality will appear to be

[34] Only some observations of the variables "Accessible" and "Handicapped" appeared to have values of 0. Note that all observations with missing values for one of the variables were already removed listwise from the dataset. Therefore, the values of 0 that remained in the dataset were the "true values" of the variables.
[35] Only observations were removed in the full models, because they include the variables "Accessible" and "Handicapped".

insignificant[36]. Another 'variable-problem' may arise when the dependent variable precedes the independent variable (reversed causation). It might be the case that the quality of the service causes the ANTE rather than the other way around[37]. Also, when inefficient/unproductive corporations are more inclined to merge than efficient/more productive corporations, costs/productivity causes the scale of the corporations rather than the other way around. Since the other motives to merge that are probably more dominant make it unlikely that only (or especially) inefficient/unproductive firms merge, this limitation might not be applicable to this industry. It is however important to keep it in mind when interpreting the results; when reversed causation occurs, the conclusions drawn in this thesis will be incorrect. Finally, since housing corporations tend to engage in other activities than renting out dwellings, they will have other sources of revenue and costs. The variable "ANTE" is calculated by subtracting compensations and other operating income from total expenses and therefore these other activities might bias the results. For this reason, the diseconomy of scale found when analysing the ANTE should be interpreted with care, because is might be the result of higher other operating income per dwelling of smaller corporations or higher other expenses per dwelling of larger corporations. Also, other activities might affect "Productivity" and "AVE" so that caution is required when interpreting and their values.

4.5.3 Further Research

In order to analyse more thoroughly, a more extensive dataset is required. First, it was not possible to directly estimate the effect of a merger on the costs of the corporations. The reason for this is that there was only data available of the housing corporations of the last three years while most efficiency effects of mergers take time to become visible in the data. Therefore, I recommend a time-series analysis over a period of (at least) 8 years that tests the effect of a merger on the costs and quality of the merged corporation in the following years. This type of study allows taking merger-specific efficiency gains (and losses) into account and reduces the problems associated with reversed causation. Second, more data should be gathered about other characteristics of housing corporations that could affect the dependent variables. By including additional relevant control variables, a better model can be estimated, resulting in more accurate conclusions. Finally, since the ANTE are based on net expenses and the AVE

[36] One example of such a confounding variable is location; on the one hand, size depends on location (corporations do not need to be large in rural areas because there are fewer residents living in that area). On the other hand, quality norms and costs may be imposed upon the corporations by the local governments.
[37] One reason for this might be that firms with high-quality services feel the need to inform their customers about their superior quality, resulting in higher costs.

are based on gross expenses, the effect of scale on fixed costs is impossible to estimate without additional information. Results will reveal more when both values are expressed in the same type of expenses. Preferably, both costs figures should not depend on other activities undertaken by the housing corporations. When costs do not depend on the earnings and costs of other activities of the corporations, the conclusions will be more accurate. Similarly, alternatives for “AVE” and “Productivity” should be created that do not depend on other activities.

Chapter 5: Conclusion

A merger can give rise to increased efficiency in the following ways. First, when marginal costs of the merging firms are different before the merger, re-allocating output from one firm to the other can reduce total costs. Second, economies of scale and scope might make the firm more efficient. The following sources of economies of scale have been identified: bulk discounts, higher efficiency in high capital equipment, spreading of the fixed costs, specialization and earnings diversification. Economies of scope can be created by pooling firm resources and benefiting from merger-specific synergies that lower total costs. Third, a merger could stimulate technological progress that leads to lower costs of production by fostering diffusion of know-how and encouraging innovation. Fourth, the merged firm might benefit from purchasing economies that result from having a stronger bargaining position for inputs and costs of capital after the merger. Finally, workers might be more motivated to work in a larger, merged firm compared to the pre-merger firm. This gives rise to higher productivity and hence, lower costs of personnel per unit of output.

After a merger, the firm might be less efficient than the individual firms were before the merger. These cost inefficiencies come from the following sources. First, the merger itself is a very costly and risky transaction, giving rise to many costs before, during, and after the merger. Second, diseconomies of scale may arise, because the larger firm has a more complex organizational structure, needs to pay higher wages or spreads its specialized resources too thin in the organization. Third, a merger could give rise to lower incentives to invest in R&D, leaving opportunities to lower future costs unexploited. Fourth, before, during, and after the merger, the managers have to make many important decisions that could be regretted in hindsight. Especially the mismatch of corporate cultures could cause problems and is often ignored during the decision process of a merger. Finally, workers might have incentives to exert less effort in a merged firm, because they like the job less or because exerting effort does not pay off. Also, employees might have more incentives to pursue personal objectives rather than those of the firm.

Furthermore, in this thesis, it was investigated whether (dis)economies of scale prevail in the market of Dutch housing corporations. First, it was hypothesized that the ANTE of the housing corporations depends on the number of dwellings that the corporation owns.

Empirical evidence was found that supports this hypothesis (when the scale of the corporation increased, the ANTE also increased), even though the effects are relatively small. Second, it was investigated whether the diseconomy of scale that was found, was due to an increase in the AVE. Based on the regression results, the hypothesis that the AVE positively depend on the number of dwellings that the corporation owns cannot be rejected, meaning that scale positively affects the AVE of the corporation. Third, it was hypothesized that the productivity of the employees decreases when the number of dwellings owned by the corporation increases. Strong evidence was found to support this hypothesis. Therefore, the effect of scale on the costs is (at least partly) due to slack effects. Finally, as a managerial implication, the effects of scale and costs on quality of the services of the housing corporations were investigated. Based on the regression results, the hypothesis that an increase in the ANTE results in lower quality is rejected, because the ANTE does not seem to have any significant effect on quality. Empirical evidence was found that gives reason to reject the hypothesis that claims that scale of the housing corporations positively affects their quality; the quality seemed to decrease when scale increased.

Important limitations that might affect the results of this thesis are the problems associated with confounding variables, reversed causation and the inclusion of both costs and income from other activities than renting out dwellings in the performance measures of the housing corporations. It is important to keep these limitations in mind when evaluating the conclusions, because they affect the results on which the conclusions are based.

The only result that cannot be generalized beyond the sample is the effect of scale on the AVE, because not all the testable underlying assumptions of the OLS regression were met. All other results that were explained are more appropriate for generalization to Dutch housing corporations[38] that were not included in the dataset or to other years (assuming that legislation and policies do not change). Based on these findings, the government should not allow mergers between housing corporations, because it results in larger corporations with higher costs (that presumably result in higher prices) and lower quality. However, other efficiency effects than scale economies and other merger benefits should also be considered when evaluating the merger.

[38] Due to the unique position of the Dutch housing corporations in the Dutch society, results cannot be generalized to other sectors.

References

Aedes. 2007. "*Dutch social housing in a nutshell*". Aedes vereninging van woningcorporaties.

Besanko, D., Dranove, D., Shanley, M., and Schaefer, S. 2010. "*Economics of Strategy*". Asia: John Wiley & Sons Pte Ltd.

Brouthers, K.D., van Hastenburg, P., and van den Ven, J. 1998. "If most mergers fail why are they so popular?" *Long Range Planning*, Vol. 31, No. 3, p. 347-353.

Carey, K., and Burgess, J.F. 1999. "On measuring the hospital cost/quality trade-off". *Health Economics*, Vol. 8, No. 6, p. 509–520.

Centraal Fonds Volkshuisvesting. 2006. "*Vervolgonderzoek Bedrijfslasten Woningcorporaties*". CFV.

Centraal Fonds Volkshuisvesting. 2010. "*Verslag Financieel Toezicht Woningcorporaties 2010*". CFV.

Crane, D.A. 2011. "Rethinking Merger Efficiencies". *Michigan Law Review*, Vol. 110.

Cummins, J.D., and Xie, X. 2008. "Mergers and acquisitions in the US property-liability insurance industry: Productivity and efficiency effects". *Journal of Banking & Finance*, Vol. 32, No. 1, p. 30-55

D'Anvers, I. 2005. "Fusies en overnames in de chemische sector". *Universiteit Gent*.

De Vocht, A. 2011. "*Basishandboek SPSS 19*". Utrecht: Bijleveld Press.

Dekker, E. 2009. "*Woningcorporaties en organisatie strategieën: Een onderzoek naar het functioneren van woningcorporaties*". Universiteit Utrecht.

Delens, G. 2005. "*Fusies en overnames in de verzekeringssector*". Universiteit Gent.

DeYoung, R. 1993. "Determinants of Cost Efficiencies in Bank Mergers". *Office of the Comptroller of the Currency*, E&PA Working Paper 93-1.

European Commission. 27 June 2007. *Case No. COMP/M. 4439 – Ryanair/Aer Lingus.* Regulation (EC) No. 139/2004 Merger Procedure.

Farrell, J., and Shapiro, C. 2000. "*Scale Economies and Synergies in Horizontal Merger Analysis*". UC Berkeley: Department of Economics, UCB.

Feldstein, M.S. 1972. "Equity and Efficiency in Public Sector Pricing: The Optimal Two-Part Tariff". *The Quarterly Journal of Economics*, Vol. 86, No. 2, p. 175-187.

Field, A. 2009. "*Discovering Statistics Using SPSS* (3rd edition)". London: SAGE Publications Ltd.

Goldschmidt, N., and Chung, B.G. 2001. "Size does matter: the effect of organizational size on customer satisfaction". *Journal of Quality Management*, Vol. 6, No. 1, p. 47-60.

Goldstein, G.S., and Gronberg, T.J. 1981. "Economies of scope and economies of agglomeration". *Journal of Urban Economics*, Vol. 16, No. 1, p. 91-104.

Graves, D. 1981, "Individual Reactions to a Merger of Two Small Firms of Brokers in the Re-Insurance Industry: A Total Population Survey". *Journal of Management Studies*, Vol. 18, No. 1, p. 89–113.

Grimpe, C., and Hussinger, K. 2008. "Pre-empting technology competition through firm acquisitions". *Economic Letters*, Vol. 100, No. 2, p. 189-191.

Hellofs, L.L., and Jacobson, R. 1999. "Market Share and Customers' Perceptions of Quality: When Can Firms Grow Their Way to Higher versus Lower Quality?". *Journal of Marketing*, Vol. 63, No. 1, p. 16-25.

Ivaldi, M., Jullien, B., Rey, P., Seabright, P., and Tirole, J. 2003. "*The Economics of Unilateral Effects"*, Interim Report for DG Competition, European commission.

Kattan, J. 1993. "Efficiencies and Merger Analysis". *Antitrust Law Journal*, Vol. 62, No. 2, p. 513-536.

Koolma, R. 2010. *"Van verhalen naar prestaties: Effectiviteit en efficiëntie van woningcorporaties"*. Vrije Universiteit Amsterdam.

Lipton, M. 2006. "*Merger Waves in the 19th, 20th and 21st Centuries*". York University.

Lubatkin, M., and O'Neill, H.M. 1987. "Merger Strategies and Capital Market Risk". *The Academy of Management Journal* , Vol. 30, No. 4, p. 665-684.

Matsusaka, J.G. 1993. "Takeover Motives during the Conglomerate Merger Wave". *The RAND Journal of Economics* , Vol. 24, No. 3, pp. 357-379.

McAfee, R. P., and McMillan, J. 1995, "Organizational Diseconomies of Scale". *Journal of Economics & Management Strategy*, Vol. 4, No. 3, p. 399–426.

Melicher, R.W., Ledolter, J., and D'Antonio, L.J. 1983. "A Time Series Analysis of Aggregate Merger Activity". *The Review of Economics and Statistics* , Vol. 65, No. 3, p. 423-430.

Motta, M. 2004. "*Competition policy*". New York: Cambridge University Press.

Muris, T.J. 1998. "The government and merger efficiencies: still hostile after all these years". *George Mason Law Review*, Vol. 7, No. 3, p. 729-752.

Napier, N.K. 1989. "Mergers and Acquisitions, Human Resource Issues and Outcomes: a Review and Suggested Typology". *Journal Of Management Studies*, Vol. 26, No. 3, p. 271-289.

Peristiani, S. 1997. “Do Mergers Improve the X-Efficiency and Scale Efficiency of U.S. Banks? Evidence from the 1980s”. *Journal of Money, Credit and Banking* , Vol. 29, No. 3, p. 326-337.

Priemus, H. 2010. “*The future of social housing - The Dutch case”*. Delft University of Technology.

Ramaswamy, K. 1997. “The Performance Impact of Strategic Similarity in Horizontal Mergers: Evidence from the U.S. Banking Industry”. *The Academy of Management Journal*, Vol. 40, No. 3, p. 697-715.

Rasmusen, E.B., and Zenger, T. "Diseconomies of Scale in Employment Contracts" *Journal of Law, Economics and Organization,* Vol. 6, No. 1, p. 65-92.

Resti, A. 1998. “Regulation Can Foster Mergers, Can Mergers Foster Efficiency? The Italian Case”. *Journal of Economics and Business,* Vol. 50, No. 2, p. 157-169.

Röller, L.H., Stennek, J., and Verboven, F. 2000. *“Efficiency Gains from Mergers*”. Discussion Paper FS IV 00-09, Wissenschaftszentrum Berlin.

Sabbatini, P. 2006. “How to simulate the coordinated effect of a merger”, *Autorità Garante della Concorrenza e del Mercato*, Temi e Problemi, 12.

Schweiger, D.M., and DeNisi, A.S. 1991. “Communication with Employees following a Merger: A Longitudinal Field Experiment”. *The Academy of Management Journal*, Vol. 34, No. 1, p. 110-135.

Silberston, A. 1972. “Economics of Scale in Theory and Practice”. *The Economic Journal*, Vol. 82, No. 325, p.369-391.

Slade, M.E. 2004. “Marker Power and Joint Dominance in U.K. Brewing”. T*he Journal of Industrial Economics*, Vol. 52, No. 1, p. 133-163.

Stiglitz, J.E., and Weiss, A. 1981. “Credit Rationing in Markets with Imperfect Information”. *American Economic Review*, Vol. 71, No. 3, P. 393-410.

Trautwein, F. 1990, “Merger motives and merger prescriptions”. *Strategic Management Journal*, Vol. 11, No. 4, p. 283–295.

Verhaegh, I., Belanina, E., Merufu, S., and Van ‘t Pad, E. 2012. “*The Effect of the Right-To-Buy on the Stock and Financial Position of Dutch Housing Corporations*”. Erasmus Universiteit Rotterdam.

Walsch, J.P. 1988. “Top management turnover following mergers and acquisitions”. *Strategic management journal*, Vol. 9, p. 173-183.

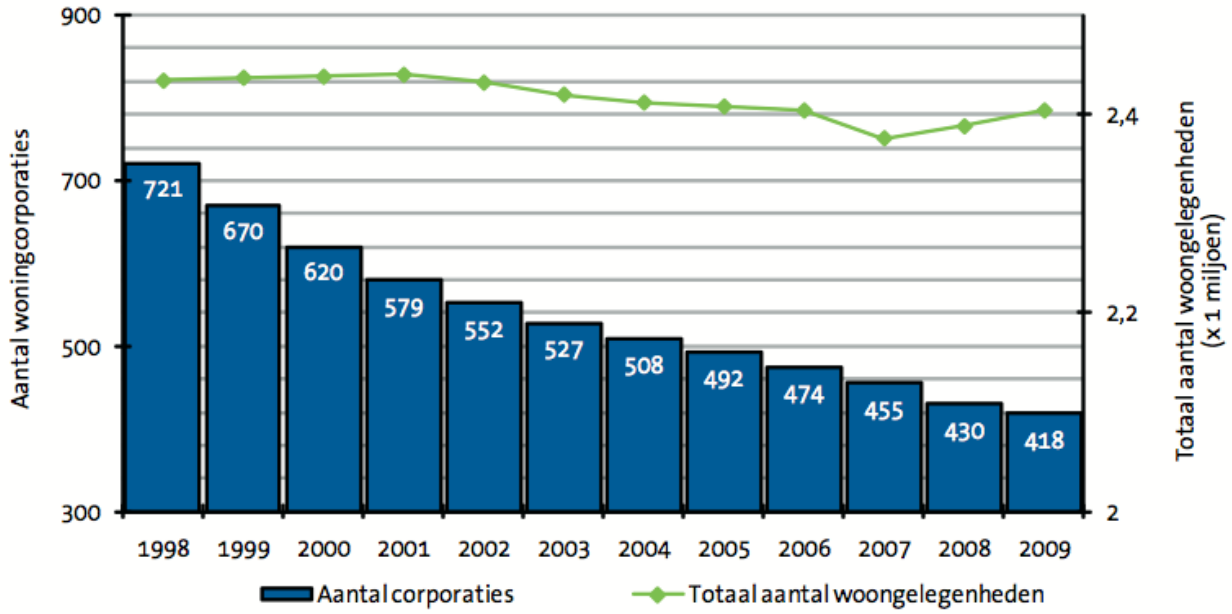
Weber, R.A., and Camerer, C.F. 2003. “Cultural Conflict and Merger Failure: An Experimental Approach”. *Management Science* , Vol. 49, No. 4, p. 400-415.

West, E.G. 1964. “Adam Smith's Two Views on the Division of Labour”. *Economica*, Vol. 31, No. 121, p. 23-32.

Zenger, T.R. 1994. “Explaining Organizational Diseconomies of Scale in R&D: Agency Problems and the Allocation of Engineering Talent, Ideas, and Effort by Firm Size”. *Management Science* , Vol. 40, No. 6, p. 708-729.

Appendix

Figure 1: Development Number of Housing Corporations



Source: CFV, 2010

Figure 2: Assumptions OLS Regression (Field, 2009 and de Vocht, 2011)

Assumption		
Variable Type	Meaning	Dependent variables are quantitative, continuous and unbounded and the independent variables are quantitative or categorical (with two values).
	Test	All variables used in the regressions are quantitative variables and all dependent variables are unbounded. No test is required.
Non-Zero Variance	Meaning	There should be variation in the values of all variables.
	Test	All variables that are used in the regression have variation in their values. No test is required.
No External Variable that Affects Predictors	Meaning	There is no "hidden variable" that affects the value of the independent variable.
	Test	All independent variables are not assumed to be affected by other variables unless stated otherwise. In this research, it is not possible to test this assumption.

Independence	Meaning	All the values of the dependent variable come from a separate entity.
	Test	Independence is assumed, but it is not empirically tested for in this thesis.
Normally Distributed Errors	Meaning	The residuals are normally distributed with a mean of 0.
	Test	When the histogram of the standardized residuals looks like a normal distribution and the normal probability plot of the standardized residuals coincides with a straight line with a slope of 90°, this assumption is assumed to be met.
Homoscedasticity	Meaning	For each value of the independent variables, the variance of the residuals should remain constant.
	Test	When the scatterplot of the standardized predicted values (x-axis) and the standardized residuals (y-axis) shows dots that are evenly dispersed around the trend, this assumption is assumed to be met.
Linearity	Meaning	There is a linear relationship between the dependent and the independent variables.
	Test	When there is no trend in the dots of the scatterplot of the standardized predicted values (x-axis) and the standardized residuals (y-axis), this assumption is likely to be met.
Independent Errors	Meaning	No autocorrelation; the residuals of any two observations should not be correlated.
	Test	When the value of the Durbin-Watson test is close to 2 (between 1 and 3), this assumption is likely to be met.
No Multicollinearity	Meaning	The predictor variables should not correlate too highly.
	Test	When the Variance Inflation Factors (VIF's) are close to 1 (lower than 5), this assumption is likely to be met.